Cambridge Recycling Participation Study
Final Results

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Introduction

This report covers the analysis of data from the combined databases from the "before", "outreach", "3-month", and "12-month" phases of the Cambridge Recycling Participation Study. Clear View Consulting submitted an Approach database to Cambridge DPW after completing the "before" phase of the study in early May 2002. DPW staff then modified this database, primarily by adding many additional fields, during the "outreach" phase. Upon completing the "3-month" monitoring in October 2002, Clear View submitted another database with those results to DPW. These two databases were then "joined" by DPW staff, and limited analysis was conducted. Since the study's methodology required CVC staff to remain "blind" as to which buildings were in which "treatment" groups, analysis could only be conducted by asking DPW staff to perform queries and searches of the joined database.

Upon completing the "12-month" monitoring phase in June 2003, Clear View submitted yet another database to DPW. This database was then joined with the earlier joined database, in theory providing one combined database with all the key data for the entire history of the study. (In practice, DPW and CVC staff found that any given search of the combined database might produce one to several "glitches" -- these were double-checked when necessary by referring to the original databases.

This report describes the most important steps taken in developing the final results for this study. Statistical analysis efforts and results will be written up in a separate report. In broad terms, the results of this study do suggest that the outreach methods being tested do have a meaningful impact on initiating recycling among previously non-recycling households. However, there are a wide variety of factors operating in a dense urban environment such as East Cambridge, which contribute a lot of "background noise" to the results. Additionally, the "3-month" results suggest that a substantial minority of households making a commitment to recycle either never actually start or drop out quickly. The dropout rate was lower from 3 months to 12 months after making the commitment. This study also found that many of the households starting to recycle set out relatively small amounts of material. Clear View believes that the average weights documented in this study are probably lower than the averages for previously recycling households, although little directly relevant data could be found to validate this belief.

"Dropped" Buildings & Effect on Various Study Group Sizes

The obvious first task in developing the "final results" of this study was to decide which buildings no longer fit the criteria for the study. Rather than discard this data outright, CVC and DPW recoded the database so those buildings could be set aside. Then, we could make all the necessary changes to our participation and weight data caused by dropping these buildings. In keeping with earlier methodology, it was decided that CVC would make these decisions while still "blind" as to which buildings were assigned to the various study groups and subgroups. Working from the list submitted with the earlier "Status Report", CVC ultimately decided to eliminate 14 buildings that contained 56 households, about 10% of the original study group. (For purposes of the outreach effort, DPW had treated these as 16 buildings, dividing two between different outreach methods.)

A listing of the dropped buildings and households is presented in Attachment 1. Of the 56 households, 11 were in the Control group, 24 were in the Brochure (or Mailing) group (of these, 4 were among the 11 mailings returned as undeliverable), 12 were in the Phone outreach group, and 9 were in the Door-to-door (or Door) outreach group. Of the dozen "Phone" households eliminated, one was a "Committer" (but the only one for which no participation had been documented), one was in the "Already Recycling" subgroup, and the other 10 had not been reached for various reasons. Of the nine "Door" households eliminated, 3 were in the "Already Recycling" subgroup, one was in the "Refused" subgroup, and 5 had not been reached.

Assessment of "Before" Participation in Various Study Groups

The next task was to develop assessments of the "Before", or background, participation so that we could improve our estimate of actual changes in participation in each group and subgroup. Although we knew that overall "before" participation had been 30 unidentified households, or 5.9% of the revised study total of 511 households, it had not previously been possible for CVC to break these out by group because of the "blind" requirement of our methodology.

The calculated "before" participation rates are presented in Attachment 2. Interestingly, there was a fair amount of correlation between "already recycling" responses and the buildings at which an unidentified participant had been noted, resulting in the highest baseline participation rates appearing in the "Door/Already Recycling" subgroup (17.5%) and the "Phone/Already Recycling" subgroup (9.5%). More importantly for the purposes of this study, the baseline participation was zero for both the "Door/Committers" and "Phone/Committers" subgroups.

Method for Allocating "Maybe" Households

One of the most significant challenges to carrying out this study was the large proportion of recycling households that could not be identified as a specific household. Some of this was due to persistent "non-bin" set-outs at some addresses (although

Cambridge, like most communities, offers free replacement bins, we found anecdotally that some households actively prefer NOT to use a bin). A larger problem was that a majority of households do not mark their bin with a name or address. Although CVC used stickers to help identify unmarked bins that we had seen before during the "before" and "3-month" monitoring, this of course did not help us to identify a specific household.

During the "3-month" monitoring, 51 of the total of 113 participants (or 45%) could not be tied to a specific household. This situation got much worse during the "12-month" monitoring, as 85 of the total of 136 participants (or 62%) remained unidentified.

This problem greatly complicated the analysis as it was originally conceived when this study was being designed. Since CVC had to convert its field results into a standardized database format with one record for each household (and no provision for other records to capture the field information about unidentified set-outs and participation), the nature and number of fields in the database had to be altered to allow the most essential information about "unidentifieds" to be preserved. So, the key "is the household participating?" field, which ideally would have been a simple binary "Yes/No", became a "Yes/Maybe/No". In the case of the "12-month" monitoring results, there were 51 records with a "Yes", 214 with a "No", and 246 with a "Maybe" in this field. However, since only 136 total households were found to be participating, this meant that 161 of the 246 "Maybes" (nearly 66%) were NOT actually participants.

To refine our ability to discriminate among all these "Maybes", a field was added to the database to show the likelihood that a particular household was a participant. For example, one unidentified participant in a triple-decker meant that all three households at that address were assigned a rating of "Maybe/33%" in the absence of any other information. Similarly, a single unidentified participant in a 6-family building meant that all 6 were assigned a rating of "Maybe/17%". In buildings with one or more identified participants, the probability was based on the remaining number of units. Although the database contained specific percentages in this "likely?" field, for discussion and analysis purposes these were grouped as follows: 50% or better = "likely", 26% to 49% = "some chance", and 25% or lower = "unlikely".

During the original analysis of the "3-month" monitoring results, since CVC was still required to be "blind" as to group assignments, all that could be done by way of analysis was to "allocate" the "maybes" in order of likelihood (and in proportion to the total number of "maybes" in each subgroup) until the total number of households observed to be recycling was reached. In the absence of specific information to justify it, allocating more of the maybes to the "committer" subgroups as opposed to the "already recycling" or other subgroups would have introduced a distinct bias into the study. This general methodology was preserved into the 12-month results analysis, except that CVC, no longer required to be "blind", could go back to the field data and look for any relevant information, which might justify allocating more "maybes" to specific subgroups. However, only a few such cases were found.

Revised Assessment of "3-Month" Participation in Various Study Groups

The next task in this analysis was to revisit the "3-month" results, and make adjustments to account for the 56 households that ended up being dropped. This was done first for the summary of field results originally prepared for the Status Report submitted by CVC after the "3-month" monitoring was completed (see Attachment 3). This had the effect of slightly increasing overall participation, from 20.2% to 22.1%, while also increasing average set-out rates from 9.2% to 10.6%. The loss of two identified households (which turned out to be "false positives" in a building which had to be dropped from the study) slightly lowered the percent identified on the West Route and for the overall study. The fact that more households were dropped from the East Route than the West meant that observed participation went up more, from 17.7% to 20.6%.

With the new "bottom line" of 113 households or 22.1% participation determined, the next step was to revise the assessment of how they broke out by group and subgroup. The revised numbers are presented as Attachment 4. Generally, most of the estimated participation rates for the various subgroups rose a bit. The most dramatic change, due to the small subgroup size, was in the "Phone/Committers", which rose from 80% to 100% due to the elimination of the only "Committer" household with a "No" participation assessment.

Assessment of "12-Month" Participation in Various Study Groups

As with the "3-month" results, the first step was to revise the summary of field results submitted with the "12-month" Status Report to reflect the dropped households (see Attachment 4). This dropped total observed participants more (from 143 to 136) but since most of the dropped participants were unidentified households, the percentage of identified households improved marginally from 36% to 38%. Overall participation rose slightly from 25.2% to 26.6%, since a majority of the households dropped were in buildings that had shown no participation. Average set-out rates rose from 11.5% to 12.4%. Mirroring the changes in 3-month results, the increases were bigger on the East Route.

Next on the agenda was the development of participation estimates for each of the groups and subgroups (see Attachment 7). Most of the various subgroups showed a slight to moderate increase from the 3-month results. However, the extremely small Phone/Committers subgroup showed a dramatic drop to only 25%, with 3 of the 4 households rated "NO participation" and the fourth rated a "Likely Maybe". The Door/Committer and Door/Refused subgroups held steady at 46.7% and 26.9% respectively.

Graphs of these results, with "Before" and "3-Month" results included for easy comparison, are presented in Attachment 6. The first graph is the "key group" comparison that is at the heart of this study: comparing the Door/Committers and Phone/Committers to the Control Group and the Brochure or Mailing Group. Sample sizes ("N=") are included to simplify interpretation. On the face of it, it appears that the door and phone groups represent a real impact of the outreach methods, although it can

be said at this point that the phone group will not be statistically significant due to the small sample size.

Because continuity of "committer" results between the "3-month" and "12-month" samples was very important to our conclusions about "drop-out" versus retention rates, some time was taken to review the "12-month" results for each of the 30 door committers. Of the 8 Committers with a 3-month "Yes" result, 4 remained "Yes", 3 were "maybe", and 1 was "No". Of the 8 Committers with a 3-month "Maybe" result, 1 became a "Yes" and 7 remained "Maybes". Of the 14 Door Committers with a 3-month "No" result, 7 became "Maybes" and 7 remained "Nos".

The apparently straightforward results in the first graph are somewhat muddied by the comparisons in the second and third graphs, which compare results among all subgroups for, respectively, the Door and Phone groups. In all cases, the subgroups that in theory should not be showing much change rose to higher levels than the Control group. The "Not Reached" subgroups in theory ought to behave much like the Control Group, with the possible exception of households who heard about the outreach from other households in their building, and were affected by it. Also in theory, the "Already Recycling" subgroups ought to have remained relatively steady to the extent they were truly recycling. Finally, the households who were reached and specifically refused to commit to recycle might be thought to be least likely to show change, although changes of heart and/or peer pressure of other households in the building recycling might play a role. These factors and others will be addressed at greater length in the write-up of the statistical analysis.

Analysis of Set-Out Weights Among "Committers"

Further analysis of the results in terms of weights of set-outs was also conducted. This work is presented in table form as Attachment 8 and in graph form as Attachment 9. Results from both the "3-Month" and "12-Month" monitoring were combined in an analysis designed to provide an estimate of the annual tonnage recycled by new recyclers (see Attachment 9). In each case, the total amount recycled by a household during the five weeks of monitoring was divided by the number of weeks the household set out to determine an average weight per set-out. The number of set-outs was then used to extrapolate an expected number of set-outs per year. This number was then multiplied by the average weight per set-out to obtain the projected annual weight, at this point still in pounds. Finally, the annual projected pounds of recyclables were converted to tons. The projected average of 0.146 tons or less than 300 pounds is lighter than what one might expect from an average recycling household. It is worth noting that projected amounts for individual households ranged from a low of 0.003 tons/year to a high of 0.535 tons/year. It is fair to say that extrapolations at either extreme are probably less accurate than those toward the middle of the range, since they may well be based on a less than representative sample collected during this particular five-week monitoring period.

Assessment of (Non-Statistical) Answers to the 8 Questions Posed At The Outset of This Study

(1) *Are non-recyclers receiving a direct appeal to recycle, coupled with an opportunity to support a charitable group, more likely to begin recycling than non-recyclers who receive only a flyer (or no contact at all)?*
Yes, at least to some degree.

(2) *Is there a correlation [technically, a statistically significant relationship] between a particular outreach mechanism, and observed recycling behavior?*
(to be addressed in next deliverable)

(3) *What is the average annual recycling tonnage for new recyclers?*
Based on the limited sample described above, we found an average of 0.146 tons annually projected for each new recycling household.

(4) What is the "drop-out" rate among households who initially commit to recycling? After 3 months? After one year?
Among the 34 "Committers", 18 were found to be recycling after 3 months, so 16 (or 47%) had dropped out (or in some cases, possibly never started at all). After 12 months, 15 were found to be recycling, so at least 19 (or 56%) had dropped out. Detailed analysis suggested that one additional "Door Committer" may have dropped out, which if true would push the total 12-month dropout rate to 59%.

(5) *What % of non-recyclers giving a written commitment to recycle is observed to be recycling one year later?*
Out of a total of 34 "Committers", we were only able to estimate that 15 (or 44%) were still recycling a year later. Of these, only 5 households were specifically identified participants; the others were all "maybes", albeit ones that we can be fairly confident about because of the conservative methodology used. We found 1 of 4 "Phone Committers" still participating and 14 of 30 "Door Committers" still participating. Of course, some of these households may have "turned over" during the intervening year and may have been replaced by other recyclers.

(6) *What % of non-recyclers receiving only a recycling brochure become habitual recyclers?*
We were only able to document 14%, above the "before" or background participation level. This is not statistically distinguishable from the effect observed in the control group, which is believed to be mostly due to household turnover.

(7) *What % of non-recyclers are we able to contact by phone to deliver an appeal to recycle?*
The outreach effort contacted 52 out of 131 households in the Phone group, or 40%. This contact rate was hamstrung from the outset by our inability to obtain phone numbers for almost half of the households originally assigned to this group.

(8) *What % of non-recyclers are we able to contact in person to deliver an appeal to recycle?*
The outreach effort contacted 96 out of 133 households in the Door group, or 72%.